

What is claimed is:

1. A short arc ultra-high pressure mercury lamp comprising:  
a silica glass arc tube filled with at least  $0.15 \text{ mg/mm}^3$  of mercury, rare gas and halogen in a range from  $10^{-6} \text{ } \mu\text{mole/mm}^3$  to  $10^{-2} \text{ } \mu\text{mole/mm}^3$ ;  
a pair of opposed electrodes each being held by a shaft within the silica glass arc tube at a spaced apart distance of at most 2 mm,  
wherein at least one of the opposed electrodes includes a part with a greater diameter formed on the shaft using a melting process, a projection formed by the tip of the shaft, and a part with a decreasing diameter which extends from the part with the greater diameter in the direction toward the projection and is also formed using a melting process.
2. The short arc ultra-high pressure mercury lamp set forth in claim 1, wherein the ratio  $L1/D1$  is 0.5 to 1.5,  
where  $D1$  is the value of the maximum outside diameter of the part with the decreasing diameter at a distance  $L1$  which is a distance in the axial direction from a tip of the projection to the maximum outside diameter of the part with a decreasing diameter.
3. The short arc ultra-high pressure mercury lamp set forth in claim 2, wherein the ratio  $L1/D1$  is 0.8 to 1.2.
4. The short arc ultra-high pressure mercury lamp set forth in claim 1, wherein width of the part with a larger diameter is 0.5 mm to 1.0 mm in an area at a distance of 0.5 mm from the tip of the projection.
5. The short arc ultra-high pressure mercury lamp set forth in claim 1, wherein the width of the part with a decreasing diameter is 0.5 mm to 1.0 mm in an area at a distance of 0.5 mm from the tip of the projection.

6. The short arc ultra-high pressure mercury lamp set forth in claim 1, wherein the part with the decreasing diameter is formed using irradiation with laser light or electron beams so as to perform heating-melting wherein the irradiation is interrupted by pauses to form a corrugated shape on the part with the decreasing diameter.

7. The short arc ultra-high pressure mercury lamp set forth in claim 1, wherein the outside surface of the part with the decreasing diameter has a corrugation.

8. The short arc ultra-high pressure mercury lamp set forth in claim 1, wherein the part with the greater diameter is coil-shaped.

9. The short arc ultra-high pressure mercury lamp set forth in claim 1, wherein the area in which the part with the decreasing diameter is connected to the part with a larger diameter has a fillet-shape.

10. The short arc ultra-high pressure mercury lamp set forth in claim 1, wherein the area in which the part with the decreasing diameter borders the projection has a fillet-shape.

11. The short arc ultra-high pressure mercury lamp set forth in claim 10, wherein the fillet-shape is formed by melting the part with the decreasing diameter to the projection.

12. The short arc ultra-high pressure mercury lamp set forth in claim 9, wherein the fillet-like shape is formed by melting from the part with the decreasing diameter to the part with the greater diameter.

13. A short arc ultra-high pressure mercury lamp comprising:  
a silica glass arc tube filled with at least  $0.15 \text{ mg/mm}^3$  mercury, rare gas and halogen in the range from  $10^{-6} \text{ } \mu\text{mole/mm}^3$  to  $10^{-2} \text{ } \mu\text{mole/mm}^3$ ;  
a pair of opposed electrodes, each being held by a shaft spaced apart at a distance of at most 2 mm,  
wherein at least one opposed electrode is manufactured by winding the shaft with a

metal filament to form a coil such that an unwound projection remains exposed on the tip of the shaft, and the filament is wound repeatedly around the shaft to form a part of the coil with a diameter which decreases in the direction toward the projection and a part of coil with a larger diameter after the part of the coil with the decreasing diameter in a direction away from the projection, and at least the surface of the part of the coil with the decreasing diameter and the surface of the part of the coil with the greater diameter are melted.

14. The short arc ultra-high pressure mercury lamp set forth in claim 13, wherein the exposed surfaces of the coiled filaments are melted to form a uniformly smooth surface with a wave-like surface profile.

15. The short arc ultra-high pressure mercury lamp set forth in claim 13, wherein a surface portion of the filament coil following the part with the greater diameter in a direction away from the projection is not melted.

16. The short arc ultra-high pressure mercury lamp set forth in claim 13, wherein the metal filament adjacent to the projection is melted to the shaft.

17. The short arc ultra-high pressure mercury lamp set forth in claim 13, wherein the metal filament is composed of tungsten.

18. The short arc ultra-high pressure mercury lamp set forth in claim 13, wherein the melting of the metal filament is performed by irradiation by at least one of an electron beam generating means and a laser light beam generation means.

19. The short arc ultra-high pressure mercury lamp set forth in claim 17, wherein the melting process is performed in several steps each of which are interrupted by pauses in the irradiation.

20. The short arc ultra-high pressure mercury lamp set forth in claim 13, wherein the ratio  $L1/D1$  is 0.5 to 1.5,

where D1 is the value of the maximum outside diameter of the part with the decreasing diameter at the distance L1 which is the distance in the axial direction from tip of the projection to the maximum outside diameter of the part with a decreasing diameter.

21. The short arc ultra-high pressure mercury lamp set forth in claim 13, wherein the ratio  $L1/D1$  is 0.8 to 1.2.

22. The short arc ultra-high pressure mercury lamp set forth in claim 13, wherein the width of the part with a larger diameter is 0.5 mm to 1.0 mm in the area at a distance of 0.5 mm from the tip of the projection.

23. The short arc ultra-high pressure mercury lamp set forth in claim 13, wherein the width of the part with a decreasing diameter is 0.5 mm to 1.0 mm in the area at a distance of 0.5 mm from the tip of the projection.

24. Method of producing a short arc ultra-high pressure mercury lamp having a silica glass arc tube filled with at least  $0.15 \text{ mg/mm}^3$  of mercury, rare gas and halogen in a range from  $10^{-6} \text{ } \mu\text{mole/mm}^3$  to  $10^{-2} \text{ } \mu\text{mole/mm}^3$ ; a pair of opposed electrodes each being held by a shaft within the silica glass arc tube at a spaced apart distance of at most 2 mm, comprising the steps of:

forming at least one of the opposed electrodes with a part having a greater diameter on the shaft using a melting process, forming a projection with the tip of the shaft, and forming a part with a decreasing diameter extending from the part with the greater diameter in the direction toward the projection also using a melting process.

25. Method according to claim 24, where the part with the decreasing diameter is formed using irradiation with laser light or electron beams to perform heating-melting and wherein the irradiation is interrupted by pauses to form a corrugated shape on the part with the decreasing diameter.

26. Method according to claim 24, further comprising the step of melting an area in which the part with the decreasing diameter is connected to the part with a larger diameter from the part with the decreasing diameter to the part with the greater diameter so as to produce a fillet-shape.

27. Method of producing a short arc ultra-high pressure mercury lamp having a silica glass arc tube filled with at least  $0.15 \text{ mg/mm}^3$  of mercury, rare gas and halogen in a range from  $10^{-6} \text{ } \mu\text{mole/mm}^3$  to  $10^{-2} \text{ } \mu\text{mole/mm}^3$ ; a pair of opposed electrodes each being held by a shaft within the silica glass arc tube at a spaced apart distance of at most 2 mm, comprising the steps of:

producing at least one of the opposed electrodes by winding the shaft with a metal filament to form a coil leaving an unwound projection remaining exposed on a tip of the shaft, the filament being wound repeatedly around the shaft in a manner forming part of the coil with a diameter which decreases in the direction toward the projection and forming part of the coil with a larger diameter after the part of the coil with the decreasing diameter in a direction away from the projection, and melting at least the surface of the part of the coil with the decreasing diameter and the surface of the part of the coil with the greater diameter.

28. The method set forth in claim 27, wherein exposed surfaces of the coiled filament are melted to form a uniformly smooth surface with a wave-like surface profile.

29. The method set forth in claim 27, wherein a surface portion of the filament coil following the part with the greater diameter in a direction away from the projection is not melted.

30. The method set forth in claim 27, wherein the metal filament adjacent to the projection is melted to the shaft.